THE TEACHING OF MANDARIN PROSODY:
A SOMATICALLY-ENHANCED APPROACH
FOR SECOND LANGUAGE LEARNERS

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ABSTRACT

For adult English speakers studying Mandarin (Modern Standard Chinese), the acquisition of the Mandarin prosody presents major difficulties. One particularly problematic aspect of the Mandarin prosodic system, and the one singled out for research here is the acquisition of tones by second language (L2) learners of Mandarin. This thesis involves a literature review and a description of an experiment conducted for the purpose of assessing the effectiveness of a new teaching method for educating students in Mandarin prosody generally, but especially with regard to "tones."

Most studies investigating the acquisition of Mandarin tones by L2 learners have treated tones as separate from other aspects of Mandarin prosody such as stress, loudness and duration. The teaching method examined in this thesis, however, takes an alternative approach. Here the acquisition of Mandarin prosody is approached as a complex dynamic that has tones as an integral part.

The aims of the study are twofold: (1) to identify the principal problems encountered by most learners in order to discover the causes of recurrent error patterns and, (2) to find out how a multi-sensory approach, which in this study was called the Somatically Enhanced Approach (SEA), might influence the acquisition of Mandarin prosody in these areas.

The experiment involved 22 adult Australian students studying Mandarin in the first three months of language training. The experimental component of the study consisted of an evaluation of two groups of students’ oral conversations. The two groups of students were divided into a control group and an experimental group. The control group was trained in a non-multi-sensory but communicative approach in 2001 and 2002. Their results are compared with those of a test group and with a group of students trained in the multi-sensory communicative approach (SEA) in 2003 and 2004. The test materials consisted of short dialogues that were likely to occur in everyday communication. Data was collected from each group, once during the first half of the first semester of study in each year.

The findings of the experiment were that the order of difficulty of the four Mandarin tones was found to be similar for both the experimental and control groups of students. However, the order
of difficulty differed from what has been reported by previous researchers. This suggests that
the input and the type of task used to collect data might exert a significant influence on the
learning of tones. In other words, the performance of subjects in the dialogues suggests that in
the initial stages of learning, the major cause of errors was first language (L1) interference
rather than the physical "difficulty" of articulating particular phonemes (or any features of
Universal Grammar). Therefore, by using a multi-sensory approach (SEA) to the learning of
Mandarin, it may be possible to considerably lessen the influence of learners’ L1 from the
outset.

Finally, a number of suggestions for improving the teaching of Mandarin prosody are made and
future research directions outlined. Some salient suggestions for teaching of Mandarin prosody
that arise from the research are:

(1) To use movement and gesture in the early stages of learning to enhance students’ perception
and production of Mandarin. This approach provides students with useful memory tools for
learning both in class and in self-accessed learning;

(2) To teach Tone 3 not as a full Tone 3 but as a low level tone. This should not be done solely
through a simple verbal explanation but through a combination of movement and gesture,
provision of visual and auditory feedback and a large amount of exposure and perception
training so that Tone 3 is recognised as a low level tone rather than a full Tone 3. By so doing
confusion is reduced between the various realizations of Tone 3 during the initial learning
stages; and

(3) To caution students about the common error patterns caused by interference from their L1.
This should be supplemented with opportunities for students to observe their own production of
Mandarin and then experience how physically they can find ways of reducing the interference.

A qualitative analysis of interview and question data obtained from this research also revealed
that the extensive use of computer enhanced language learning and SEA work well together, not
only efficiently conditioning students to the phonology of Mandarin, but dramatically changing
students' strategies in learning and increasing their learning opportunities.
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GLOSSARY

Words, definitions and abbreviations in alphabetic order:

WORDS AND DEFINITIONS:

**Allotone**: Tone 3 as it possesses two allotones: one dipping and one rising. In other words, though Tone 3 occurs in these two forms, the variation does not affect the tone’s functional identity in the language, i.e. no change in meaning is involved. (Cheng, 1973; Hatch & Lazaraton, 1991; Hatch, 1983; Hombert, 1975, 1989b:159)

**Downtrend**: A combination of downstep and declination. Downstep and declination are important aspects of intonation. Downstep refers to the phenomenon that a high (H) pitch target has lower F0 height after a low (L) pitch target; while declination refers to the tendency for F0 to gradually decline over the course of an utterance. A broad term “downtrend” is used to describe the combined effects of the two.

**Dyspraxia**: Developmental dyspraxia is an impairment or immaturity of the organization of movement. It is an immaturity in the way that the brain processes information, which results in messages not being properly or fully transmitted. The term dyspraxia comes from the word praxis, which means “doing, acting”. Dyspraxia affects the planning of what to do and how to do it. It is associated with problems of perception, language and thought. Retrieved on 17th of July, 2005, from http://www.dyspraxiafoundation.org.uk/dyspraxia-information/whatis.html

**Finals**: Vowels in Mandarin: The final is the part of the syllable excluding the initial. There are thirty-seven finals in Mandarin.

**Fundamental frequency**: A term which is derived from the study of the physics of sound, and used in acoustic phonetics. It refers to the lowest frequency component in a complex sound way (other components being known as the “harmonics”). Frequency refers to the number of complete cycles (opening and closing movements) of vocal cord vibration in the unit of time
The “fundamental”, or F₀ (“f nought”), is of particular importance in studies of intonation, where it displays a reasonably close correspondence with the pitch movements involved. It is measured in hertz (Hz), a term which has replaced the older “cycles per second”. (Crystal, 1997)

**Headturn preference procedure:** This procedure was originally developed by Fernald (1985) for her investigations of infants’ listening preferences for infant- versus adults-directed speech. She used a three-sided testing booth that was open on the fourth side. White curtains were hung between the ceiling and the top three sides of the booth in order to block the infant’s view of the rest of the room. Loudspeakers were mounted into the walls of the two panels at about the level of the infant’s head. A small red light located on each side of the panel in the vicinity of the loudspeaker. The centre panel, which the infant faced, had a small green light mounted at infant’s eye level. Directly below this light there was a 5 centimetre hole cut into the panel for the lens of a video camera. A chair was situated in the centre of the booth approximately even with the two side lights and facing the centre panel. The caregiver sat on this chair and held the infant on her lap. In her use of the headturn preference procedure, Fernald’s primary dependent measure was the direction of the infant’s first head trial. Experimental sessions began with a series of training trials and infants were familiarized with four different 8-second speech samples, available on the two sides of the booth. To start a training trial, the green light on the centre panes was flashed to draw the infant’s attention. When a judge, viewing a video monitor in another room, decided that the infant was looking straight ahead, the green light was turned off. The judge then signals another experimenter to turn on one of the two red side lights. The choice of whether the left or right side light was flashed on a trial followed a training order that was set up for a given subject. The experimenter was responsible for turning on the tape recorder that played the type of speech sample appropriate to that side (e.g., infant-directed
speech samples on the left and adult-directed samples on the right). The assignment of sample
types to sides was counterbalanced across subjects. When a given sample ended, the red light
was extinguished and the green centre light was flashed until the infant’s gaze was centred.
Then the next trial began. If the infant did not spontaneously respond to the flashing light within
the first few seconds of a training trial, the caregiver was asked to turn the infant in that
direction. After four training, the caregiver was instructed to keep the infant centred and not to
turn the infant during the remaining trials. Both the caregiver and the judge wore headphones
and listened to recorded music to mask the speech samples presented during the experiment.
During the test phase, the presentation of a speech sample was made contingent upon a 30°
headturn by the infant. As in the training trials, the green light was used to attract the infant’s
gaze to midline. After it was extinguished, the first 30° headturn to the left or right resulted in
the presentation of a speech sample appropriate to that side accompanied by the blinking red
light. Each sample was played to its completion regardless of whether the infant looked away
before it finished. Infants had to complete at least 15 test trials to be included in the study.
Subjects were scored as to the number of trials that they turned to a given side. Fernald (1985)
found that infants turned significantly more toward the side with the infant-directed speech
samples.

**Initials:** The initial represents the consonantal beginning of a syllable. Since Mandarin does not
have consonant clusters (sequence of consonants), the consonantal beginning of a syllable can
only be a single consonant. There are, however, Mandarin syllables that do not have any initial
consonants. For those syllables the tradition is to describe their initials as “zero”.

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Kinemorphae: The term kinemorphae or movement Gestalt is used here in the meaning of the Japanese term Kata. It denotes a wide-ranging class of dynamic cultural transmissions that comprises elements such as dance, but also gymnastics, martial and marital arts, and juggling, etc., whose common denominator is that they involve complex movement patterns of the body. Retrieved on 15th of November, 2004 from http://www.uni-ulm.de/uni/intgruppen/memosys/des24n.htm#fnB531

Mean F0 SD: Standard deviation of the mean fundamental frequency is the acoustic measure which measures the range of pitch (auditory) of a person’s voice level. In this thesis, it is not a measure of the highest or the lowest point of a person’s voice level.

Pitch: The attribute of auditory sensation in terms of which a sound may be ordered on a scale from “low” to “high”. It is an auditory phonetic feature, corresponding to some degree with the acoustic feature of frequency, which in the study of speech is based upon the number of complete cycles of vibration of the vocal cords. Variations of pitch are more easily produced using voiced sounds, because of their regular wave-form. (Crystal, 1997)

Pitch range: Highest point of the fundamental frequency of a person’s voice through to the lowest point of the fundamental frequency of a person’s voice level.

Proprioception: The ability to sense stimuli arising within the body. Even if you are blindfolded, you know through proprioception if your arm is above your head or hanging by your side. The word “proprioception” was coined in 1906 by the English neurophysiologist Charles Sherrington who received the Nobel Prize for Physiology or Medicine in 1932 for research on the function of the neuron and study of reflex action. Retrieved on the 15th of November, 2004 from http://www.medterms.com/script/main/hp.asp

Semitone: It has been pointed out that the statistics of F0-values are often not very well described by a normal distribution. If F0 is scaled linearly (in Hz), there is, typically, some positive skewness (Traunmuller & Eriksson, 1994). In order make the results from different groups in this study more comparable, the average mean F0 SD for the group is also reported in semitones. Traunmuller and Eriksson further points out that the liveliness of a discourse can be
observed by comparing the F₀-exursion of the utterances which is measured in semitones. In other words, the higher the SD of the average mean F₀ measured in semitones, the livelier the discourse (Traunmüller, 1994).

**Tension:** A term used in phonetic classification of speech sounds, referring to the overall muscular effort used in producing a sound. The contrasts are labelled variously, e.g. fortis v. Lenis, tense vs. lax. This contrast is viewed as particularly important in distinctive feature theories of phonology, where tense is one of the main features set up to handle variations in the manner of articulation. Tense sounds are sounds produced with a relatively strong muscular effort, involving a greater movement of the (supraglottal) vocal tract away from the position of rest (cf. fortis) and a relatively strong spread of acoustic energy. The opposite term in Jakobson and Halle’s system is lax. (Crystal, 1997)

**Tone sandhi rules:** Tone sandhi may be described as the change of tones when syllables are juxtaposed. To put it differently, a syllable has one of the tones in the language when it stands alone, but the same syllable may take on a different tone without a change in meaning when it is followed by another syllable. A tone sandhi rule in Mandarin involves the second tone, which changes into the first tone when it is preceded by either the first or the second tone and followed by any one of the four tones. Two important tone sandhi rules in Mandarin involve the third tone:

Tone sandhi rule 1: When a third tone syllable is followed by a syllable with any tone other than another third tone, the third-tone syllable changes to a low-tone syllable with the pitch contour 21. For example, mā “horse” has the third tone in isolation, but when it is followed by another syllable such as chē “vehicle”, the sequence is pronounced with following tone sequence: mā(21) chē(55).

Tone sandhi rule 2: When a third tone syllable is followed by another third tone syllable, the first one changes into a second tone. For example, gān “to chase” and guī “demon” both have third tones. When they are in sequence, gān guī “to exorcise demons”, gān is change from third tone (214) to second tone (35)
Neutral tone: if a syllable has a weak stress or is unstressed, it loses its contrastive, relative pitch and therefore does not have one of the four tones described above. In such a case, the syllable is said to have a neutral tone. According to Chao (1968:3), the pitch of the neutral tone is:

- Half-low after first tone: tā-de-his;
- Middle after second tone: hóng-de- red one;
- Half-high after third tone: wō-de- my;
- Low after fourth tone lù-de=green one.

(Neutral tone in this thesis is indicated with a number 5 after the syllable. In some books, the neutral tone is represented by 0 rather than 5) (Li & Thompson, 1989)

**VTM:** Verbo-tonal method of phonetic correction. Method of speech rehabilitation for persons with communication impairments, based upon body movements which imitate articulatory movements of speech or based upon amplification frequencies that are not perceived. (Blouin & Bergeron, 1997:49).

**ABBREVIATIONS:**

**AE:** American English

**ASL:** American Sign Language

**ASR:** Automatic Speech Recognition

**BD:** Beijing dialect on which Mandarin is based on.

**CAL:** Computer Assisted Learning

**CALL:** Computer Assisted Language Learning

**CAPT:** Computer Assisted Pronunciation Technology
CP: Critical Period

ERP: event related potential

FD: Fundamental Difference

FL: FL

IL: Interlanguage

L1: First Language

LAD: Language Acquisition Device

MLU: Mean Length of Utterances

NS: native speaker

NNS: non-native speaker

L1: First Language

L2: Second Language

OP: Optimum Period

SEA: Somatically-Enhanced Approach

SLA: SLA

SLM: Speech Learning Model
SP: Sensitive Period

TL: TL

TPR: Total Physical Response

UG: Universal Grammar